CIAM FLYER

The Introduction to the Modelaircraft World

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Editor: emil.giezendanner@modellflugsport.ch

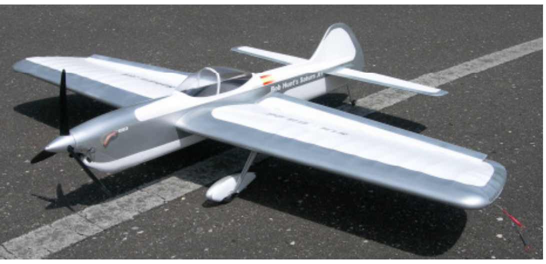
Control Line Aerobatics

Once a model aircraft – be it radio-controlled or free-flying – has taken off, you may be able to follow it with your eyes, but you no longer have any direct connection with it. Even the flight path can at best be influenced via your RC transmitter. Control line models remain the only exception!

Round and round in a circle – but that's not all
Control line model aircraft are controlled in a circle using two cables. A handle is used to control the elevator via these two cables. After a few flights, the fact that you are revolving when flying becomes totally immaterial – initially the biggest skill is required to somehow keep this machine in the air, that is vibrating in your hand and constantly wanting to fly in the wrong direction, and then land it without damage. Once you've managed that, interestingly, you'll very soon be wanting to fill up and try "it" again…

You'll feel control line models with your own hands.
Every control line model communicates with its pilot in its own way. It moves in some direction, accelerates, vibrates and thus informs you of its flying state. You can feel this very accurately as you've got your hand on the controls of this very responsive aircraft that is extremely sensitive to all influences. You can feel even the lightest wind and every change in engine power. Control line models are designed so that complex manoeuvres can be flown using only the smallest movements of the elevator. This also means, however, that they will not hold their course unaided and need to be constantly controlled which of course means that you have to remain highly focussed during the entire flight. Even though one flight may last only a few minutes, it is quite demanding and therefore always feels like a short journey into another world. After a short while you'll no longer notice that you are revolving. You're just flying – more or less straight ahead – until you run out of fuel and then you land the gliding model.

...and it all started with a looping
Surely it happened with an inexperienced pilot, who, during his



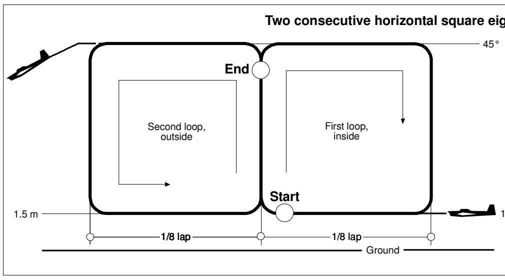
first take-off with a control line model, kept the elevator pulled firmly until the model was back on the ground. You could maybe say that this is how aerobatics were invented. Especially when clever designers started to develop models whose aeromechanical design meant that the first looping did not necessarily have to end with a crash.

Practice makes perfect
Since the 1950s control line aerobatic pilots have been trying to not only master first simple and then increasingly complex manoeuvres but also to smoothly fly them with high precision. Actually flying the figures is anything but straightforward, as the reaction times required by the pilot are well below the reaction limit. This means that it's not enough to know how to do it. You need to practise. A lot. The model itself also plays an important role and usually this is completely self-built.

Control line pilots are also designers
For getting started with control line aerobatics, you can find simple kits or construction drawings that have been proven over many decades. To make the right choice it is a good idea to get advice from an experienced aerobatic pilot. However, once you're an expert, before you even start flying, you'll want to design and build a model that can fly complex manoeuvres in a very restricted space on a hemispherical flight path. This is not an easy task, as the forces acting on the model on this flight path vary hugely in direction and strength. You'll also have to bear in mind that a model aircraft can only be controlled by the control lines as long as they are sufficiently tensioned in every flight situation and aspect.

Requirements for an aerobatic model
In order to be able to fly the required tight manoeuvres on the hemispherical flight path, the models have to be light as well as able to withstand substantial stresses. The wings have to be designed to temporarily provide a lot of lift when flying sharp turns. Along with low wing loading, the thick, fully symmetric profiles and large camber flaps are another unusual feature. The camber flaps are connected to the elevator and operate in the opposite direction. The two flap systems are controlled via a reversing lever by moving the control lines relative to each other. As the strong lift during a sharp bend considerably decelerates the aircraft, the propulsion system has to be capable of subsequently accelerating the model as quickly as possible.

The engine is not controlled
Building regulations for control line aerobatic models do not permit any control of engine power by the pilot. Because of this, clever designers have developed tank systems that keep the fuel supply to the engine constant, independently of flying aspect and fuel level in the tank. Additionally, suitable two-stroke engines are operated so that their operating point is close to the maximum torque and the engine independently increases its power during loading (climbing) and reduces it during unloading (diving). This method of self-regulation works quite well.



How aerobatic pilots compete against each other
Every year, dozens of very popular control line aerobatic competitions are held around the world. World and European championships have – together with other control line categories – two to three hundred competitors taking part. In the aerobatics class your figures will be awarded points by judges. You will only very rarely manage to fly a manoeuvre without the judges noticing a fault. It is even less likely to fly an entire series of different manoeuvres, a programme, as the aerobatic pilots call it, faultlessly. To find out more about international rules and figure programmes, visit the website of the international association FAI

http://www.fai.org/aeromodelling/documents/sc4

and look under "Control Line Competitions". Good luck!